Applied Information Technology And Computer Science Vol. 4 No. 2 (2023) 1986 - 1998

AITCS

Homepage: http://publisher.uthm.edu.my/periodicals/index.php/aitcs
e-ISSN :2773-5141

Environment Aspect Impact Information System

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DOI: https://doi.org/10.30880/aitcs.2023.04.02.111
Received 24 June 2023; Accepted 27 October 2023; Available online 30 November 2023

***Abstract**: The Web-Based Environment Aspect Impact system is a green building rating tool built for Sawit Kinabalu Sdn Bhd that helps to improve business processes that still use Excel sheets for manually filled assessments. The system was developed to improve the business process of operating unit in rating and recording aspects and impact, to carry out a comprehensive report and to make the report compliance with certification. The target user of the system is the operating unit, manager, and the sustainability unit with 5 modules provided. This study is conducted by using agile scrum methodology and programming languages for system development is Laravel and local server, XAMPP as a database. This develops system can be able to help provide efficiency to the operating unit and staff while auditing the work activity.*

***Keywords**: Green building system, web-based system, certification*

1. Introduction

Sawit Kinabalu Sdn Bhd is the premier investment arm of the state government in the oil palm industry and environmental protection action must be taken to ensure that the environment will not be destroyed or interrupted while gaining income from it. The aspects and impact of work activity happen all around of estate and mill is recorded by operating unit, but the problem is the raw data is manually filled to the excel sheet every time they have audition, it takes a lot of time and effort to complete it. Besides that, the data must be analysis and summarized first before generating the report, human error may occur during the progress and cause some mistakes on the report. A comprehensive report must be carried out to compliance with the certification and law requirements and the whole business operation will be affected.

Hence, objective in this project is to design a system to improve business process of operating unit in rating and recording the environment aspect impact, to develop a system to carry out a comprehensive report using web-based approach, and to test the system that compliance certification and law requirement. The scope of this project is to develop a system to address the unsmooth spinous process. For the target user of the system is the operating unit, the manager, and the sustainability team of the company, the system overall is set on a private server. At the end of the project, the Environment Aspect Impact system are able to provide efficiency to the operating unit while auditing the estate and mill.

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The rest of the paper was organized as follows: Section 2 discusses the literature review of the related work and existing applications. Next, the methodology used to develop the application including the analysis and design is described in Section 3. Finally, the last section concludes the current work and highlights the future work to be performed in Final Year Project 2.

2. Related Work

This literature review was carried out to obtain a study of the existing system at present. In this section as well, various materials are used as reference sources such as journals, theses, mass media and many more. Besides that, the concept of data and information and research is carried out on the existing system. This comparison of the existing system is carried out to study the features used, technology, interface as well as the improvement of the existing system that can be implemented to the system that will be developed.

2.1 Green Building Rating System

Constructing buildings significantly affects the environment both directly and indirectly since they use energy, water, and raw materials during their construction, occupation, refurbishment, re-purposing, and demolition [1]. Hence, the building sector has shown a greater interest in promoting green buildings during the past 20 years. To support sustainable innovations in both products and processes, numerous policies, rules, regulations, and standards have been developed. Additionally, various countries throughout the world have implemented a range of green building grading systems to help and provide the project team with a guide for integrating sustainability principles throughout the whole building life cycle. In other words, the green rating system defined as "a set of prerequisites and requirements that a project team must fulfil to receive certification" by the green building research institute (GBRI). Different sustainability levels and criteria are covered by green rating systems, which help project teams choose how many credit points they should earn.

2.2 Laravel

The creation of Laravel was first developed by Taylor Otwell in July 2011 [2] and it is the PHP-based web framework that allows developers to build powerful and secure web applications. If the developers are familiar with the PHP language, it can make the work become easier. The model-view-controller (MVC) architecture pattern, which Laravel uses, divides an application's components into three categories which is the model, the view, and the controller. Laravel helps developers by saving them time and the hassle of starting from scratch when planning online applications. The Laravel framework enables developers to install numerous work-related packages, which makes the logical and coding parts easier. Developers of web-based applications are increasingly turning to the Laravel framework, which is one of the most well-liked frameworks. Modern technology requires that we consider security, and for this reason, developing web applications with Laravel is the best option.

2.3 Study of Existing Related System

The existing applications that are similar to the environmental aspect impact system are Leadership in Energy and Environmental Design (LEED), Building Research Establishment Environmental Assessment Method (BREEAM), and Green Real Estate (GreenRe). To assist in the research of the proposed system, three current systems are examined using each system's features and will be addressed in the section below. Additionally, a tabular comparison of the variations between the existing system and the proposed system is provided in Table 1.

Table 1: Comparison between Existing Systems and Proposed System

Features	LEED	BREEAM	GreenRe	EAI: Environmental Aspect Impact
Data collecting method	Checklist or Excel spreadsheet	Checklist and Excel spreadsheet	Checklist	Checklist or Online form
Checklist's format	English, Spanish, Portuguese, Arabic, and Chinese	English	English	English
Data Gatherer	Management team or Accredited Professional	Management team	Assessors	Operating Unit
Rating Presentation method	Certified / Silver / Gold/Platinum	Unclassified/ Pass / Good / Very Good/ Excellent / Outstanding	Bronze / Silver / Gold/Platinum	Significant Risk/Non Significant Risk
Easy to access	√	√	√	√
Login authentication	√	√	√	√
View statistic	√	√	x	√
User convenience	√	√	√	√
User's clarity	√	√	√	x
Comparability between different building	√	√	√	√
Result Usability	x	x	√	√

In conclusion, the proposed environmental aspect impact system is obviously beneficial, and it has more functional than the other three selected existing system as well as excluding the user's clarity module.

3. Methodology/Framework

For this section, the chosen methodology to develop the Environment Aspect Impact system will be discussed and explained in each phase. The software development methodology is a process or series of processes used in software development that describes the life cycle of the software [3]. Every different type of methodology has different features and approaches in implementing and delivering the system. Effective project management is crucial for the success of software development [4]. In the initial phase of the project, I conducted interviews and collected requirements from key stakeholders. I had insightful discussions with individuals from MZR Group, including Mrs. Norfai'eza Zainuren, as well as representatives from Sawit Kinabalu Sdn Bhd Company, namely Mr. Asbudi Amire. These

interviews took place during the sprint sessions within the Agile Scrum model, which was chosen as the methodology for this project.

As shown in Table 2, each phase of the prototype model has its own set of tasks and activities that must be completed to produce the desired output.

Table 2: Software development activities and their task

Phase	Task	Output
Initiation	i. Conduct interviews with stakeholders ii. Define user stories and features. iii. Create a prioritized wished list	i. Gathered requirements from Sawit Kinabalu Sdn Bhd ii. Document user stories and features
Planning	i. Decide the scope of work and task that should be done during a sprint. ii. Breaking project into timed-boxed iterations	i. Create sprint schedule and backlog. ii. Email invitation to the development team about sprint schedule
Daily Sprint	i. Complete their task given in sprint backlog. ii. Hold daily scrum meetings	i. Meets the aims assigned by sprint. ii. Updated status, progress, and plans communicated
Sprint Review	i. Demonstrate and review the work or product to the product owner or client. ii. Gather feedback and suggestions. iii. Decide what to be completed next sprint	i. RESIP UTHM: Sprint Review Meeting that occurs every two weeks. ii. Demonstrated implemented functionalities and gathered feedback.
Sprint Retrospective	i. Reflect on the sprint and project progress. ii. Discuss changes and improvements	i. Identified areas for improvement and lessons learned. ii. Defined actions for process improvement and next sprint planning

3.2 Function and Non-Functional Requirements

Functional requirements are focused on how the system must work and specify the intended behaviour of the system. In functional requirements analysis, there are three positions: operating unit manager, operating unit and sustainability team. All roles share nearly identical functionality, including the ability to view configuration dashboard and access configuration and login pages. The account must be registered by the admin for other users to log in. For a software system to be usable, non-functional requirements are essential, and if they are not stated carefully, the end users' experience may not good.

Functional Requirements:

- Login/Signup
- General Configuration
- Assessment Form
- Generate Report
- Logout

Non-Functional Requirements:

- Operational
- Security
- Performance

4. System Analysis and Design

In the system development process, analysis of system requirements is an important aspect. Analysis of requirements ensures that system developers and users do not face problems such as information errors and so on. This phase is carried out after the planning phase has been carried out at the initial stage to obtain complete information about the system to be developed.

4.1 Business Workflow

Business workflow describes the phases that make up a corporate work process and describes how these phases can be completed and automated utilising a set of procedural rules. It is also beneficial in ensuring that crucial tasks are carried out accurately each time. Figure 1 will describe the business workflow of the environmental aspect impact system.

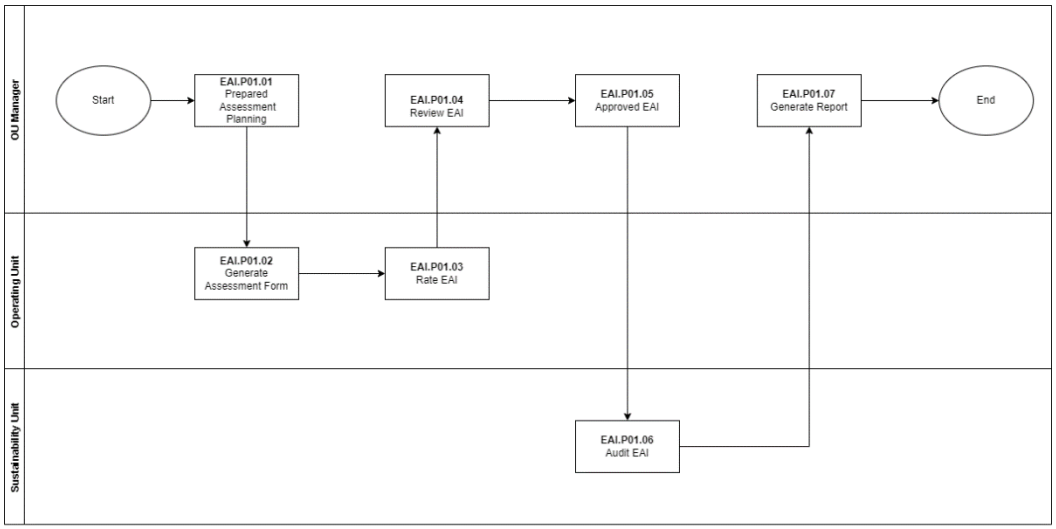


Figure 1: Business Workflow of Environmental Aspect Impact Sytem

4.2 Use Case Diagram

Use Case Diagram of UML is to present a graphic overview of the functionality provided by the system in terms of actors, their purpose, and the dependencies between these use cases [7]. A use case diagram can be used to summarize some of the relationships between use cases, actors, and systems simply by gathering and identifying the internal and external influenced factors for the requirement of the system. Figure 2 will describe the relationship between the project's requirements and actors.

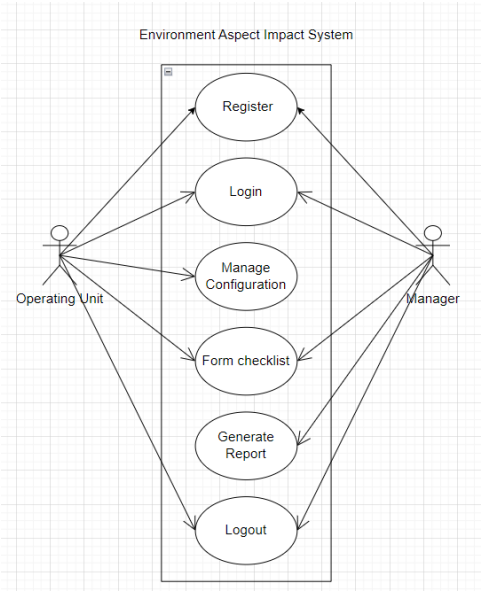


Figure 2: Use Case Diagram

4.3 General System Architecture

In software development, the process of developing a system's components is referred to as system design [5]. To define, create, and design a system that would meet requirements and needs, system aspects including the architecture, modules and components, interfaces, and data are included in the system design process. A flowchart is used to show the architecture of the system for a mobile application for managing the retail sales of vegetables. The architecture is used to explain the structure and behavior of the system. The modules are derived from several parts that would carry out a certain system function. Each component in the system is given a component assignment and serves as a representation of that component for one particular task. The system architecture design of Environment Aspect Impact system is shown in Figure 3.

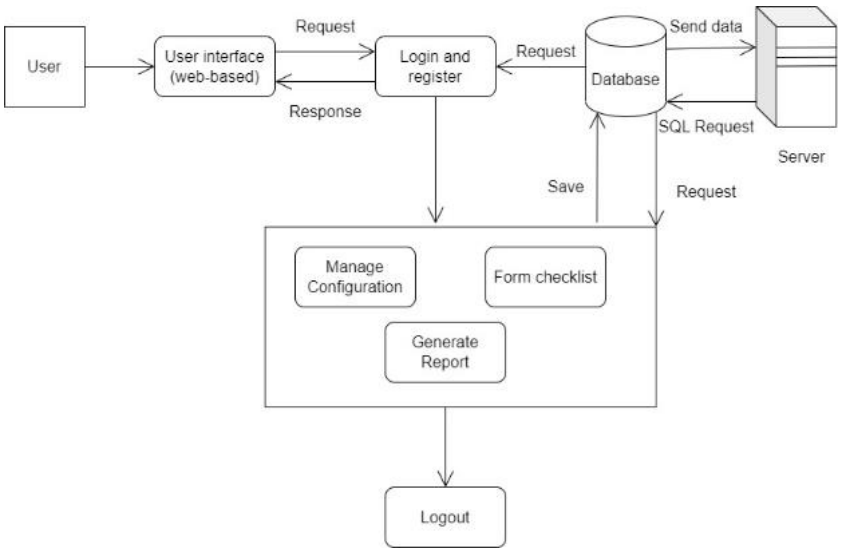


Figure 3: System architecture design of Environment Aspect Impact System

4.4 Class Diagram

Unified Modeling Language (UML) is a modeling language developed to simplify the software design process. While a class diagram is one such type of UML diagram which helps to express the classes and the relationship between the classes [6]. In Figure 4, the class diagram of the environment aspect impact system is shown.

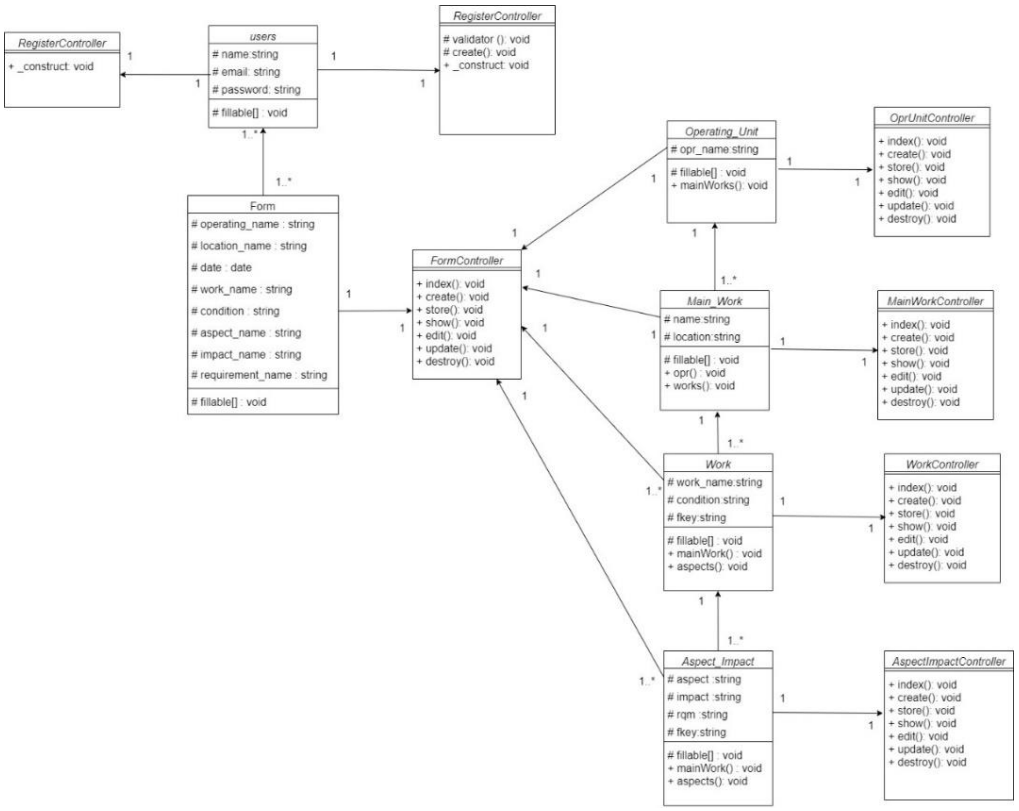


Figure 4: Class Diagram

5. Results and Discussion

In this chapter, it describes the results of the testing that was conducted for the proposed system. This chapter involves two sub sections which are section 5.1 for test plan and section 5.2 for user interface.

5.1 Test Plan

A test plan is implemented to ensure that all functions are working properly. It will help in determining the quality level of the built system. It will help in determining the amount of effort required to verify the quality of the application. The test category is implemented based on the user category. Table 3 shows the test category and Table 4 shows the test plan for proposed system.

Table 3: Test Category

Test Category	Description
1	Test function for operating unit
2	Test function for manager

Table 4: Test Plan for Proposed System

Module	Test Category	Expected Result	Actual Result
Login	1	The operating unit can log in to the system using email and a password	Pass
	2	Manager can log in to the system using email and password	Pass
Logout	1,2	The user can logout from the system	Pass
Register Account	1	The operating unit can register a new account	Pass
	2	Manager can register a new account	Pass
Manage configuration	1	The operating unit can perform actions such as add, update, and delete the configuration information successfully	Pass
	2	Manager can perform actions such as add, update, and delete the configuration information successfully	Pass
Assessment Form	1	The operating unit can rate the work activity by selecting the location, work activity, aspect and impact option in the dropdown list or radio button.	Pass
	2	Manager can open and review the form that is done by operating unit.	Pass
Generate report	2	Manager can generate the report into pdf document successfully.	Pass

5.2 User Interface

An application's or device's user interface (UI) is the visually appealing portion that controls how users interact with it and how information is shown on screens. Below Figure 5 to Figure 12 shows the system user interface.

Figure 5 shows the interface of the login page. The manager and operating unit are able to login to the system by using email and password.

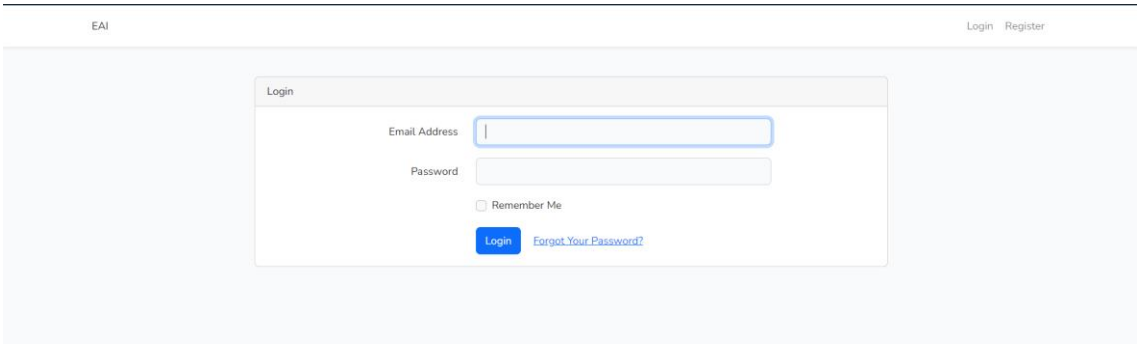


Figure 5: Login page

Figure 6 shows the interface of the configuration dashboard that can review all the record details based on the configuration chosen. For example, the user can be able to review all the location record at location configuration, and have further action such as view, edit, delete in this interface. All the features are also available for other categories such as operating unit, work activity, environmental aspect, and environmental impact.

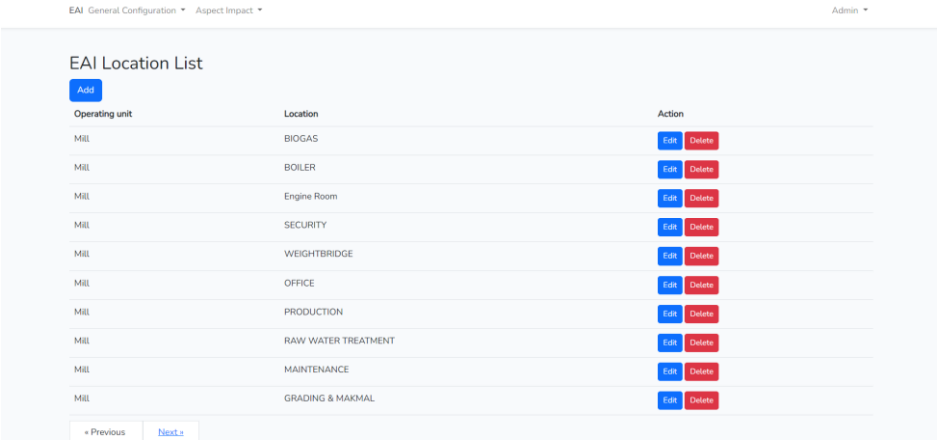


Figure 6: Configuration Dashboard

Assessment form module allows the user to record the environmental aspects and impacts happening in the selected location at the assessment form that provided by the system. The aspect impact form divided into four layers. The first layer is the operating unit, the second layer is work activity, the third layer is aspect impact, and the fourth layer is importance and risk control layer. Figure 7 shows the operating unit form index page, all the operating unit's records are shown in a table. The operating unit records shown in the table are operating unit, location, date, prepared by, checked by, and approved by. The actions provide for user to handle the records which is add aspect impact, edit, delete, work activity, and print. The work activity button enables users to move on to the next layer of form. Besides that, the print button enables users to print the record into pdf file.

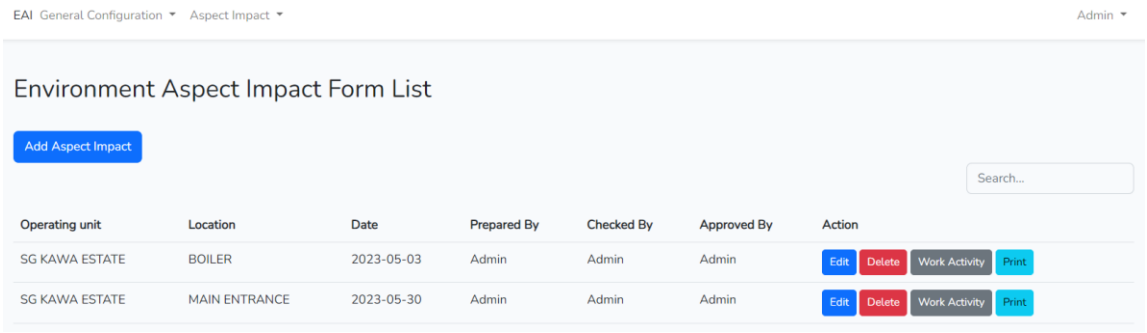


Figure 7: Interface of operating unit form index page

Figure 8 shows the work activity form index page, all the records of work activity are shown in a table. The work activity records shown in the table are work activity and condition. The actions provide for user to handle the records which is add work activity, edit, delete, and aspect impact. The aspect impact button enables users to move on to the next layer of form.

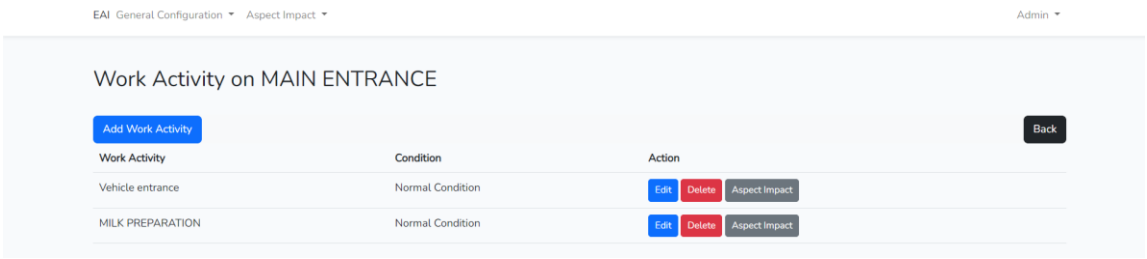


Figure 8: Interface of work activity form page

Figure 9 shows the aspect impact form index page, all the records of aspect impact are shown in a table. The aspect impact records shown in the table are aspect, impact, and requirement. The actions provide for user to handle the records which is add aspect impact, edit, delete, importance, and risk control. The importance and risk control button enables users to move on to the next layer of form.

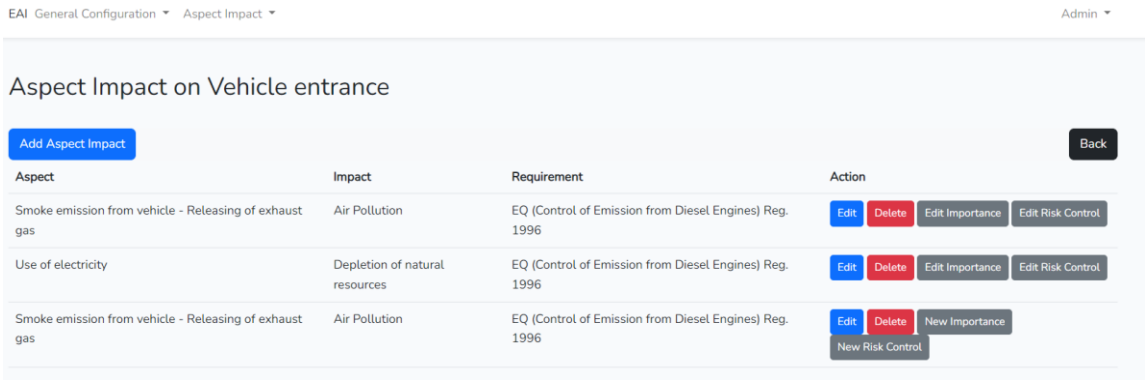


Figure 9: Interface of aspect impact form page

Figure 10 shows the importance rating section index page for the assessment form. This section comprises five risk assessment categories: frequency, severity, regulatory compliance, control, and likelihood. Each of these categories is represented by five radio buttons, ranging from one to five. After the user has selected rating for each category, the system will automatically calculate accumulated ratings and show whether the risk assessment is significant risk or not.

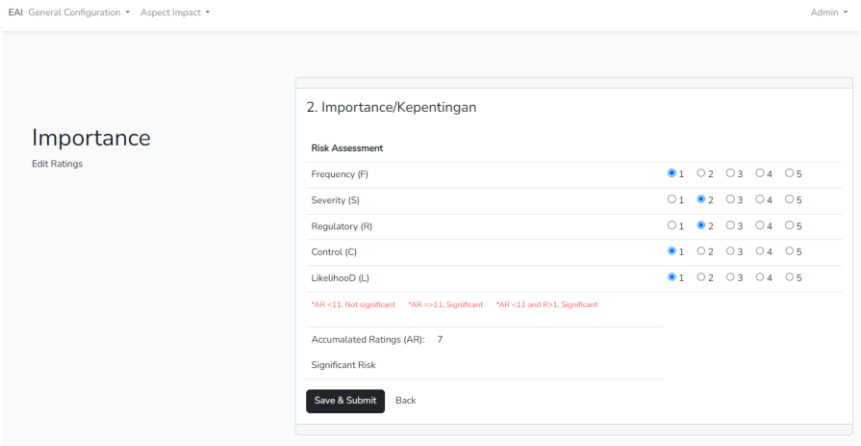


Figure 10: Interface of important rating section index page

Figure 11 shows the risk control section index page for the assessment form. This section comprises five categories: existing control measures, action plan, person in charge, time frame, and status. Each of these categories is represented by text field and user can insert record data into the system for each specific category.

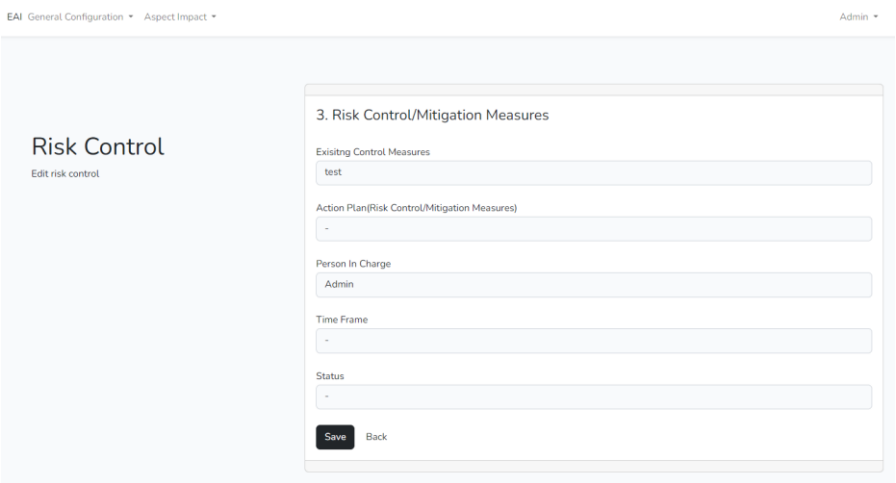
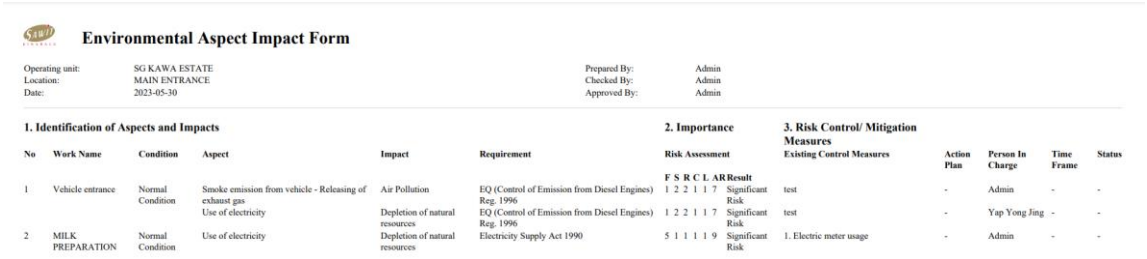


Figure 11: Interface of risk control section index page

Figure 12 shows the environmental aspect impact PDF form interface of the proposed system after user click the print button at assessment form.



Environmental Aspect Impact Form

Operating unit: SG KAWA ESTATE
Location: MAIN ENTRANCE
Date: 2023-05-30

Prepared By: Admin
Checked By: Admin
Approved By: Admin

1. Identification of Aspects and Impacts						2. Importance		3. Risk Control/ Mitigation Measures				
No	Work Name	Condition	Aspect	Impact	Requirement	Risk Assessment		Existing Control Measures	Action Plan	Person In Charge	Time Frame	Status
						F S R C L AR	Result					
1	Vehicle entrance	Normal Condition	Smoke emission from vehicle - Releasing of exhaust gas	Air Pollution	EQ (Control of Emission from Diesel Engines) Reg. 1996	1 2 2 1 1 7	Significant Risk	test	-	Admin	-	-
			Use of electricity	Depletion of natural resources	EQ (Control of Emission from Diesel Engines) Reg. 1996	1 2 2 1 1 7	Significant Risk	test	-	Yap Yong Jing	-	-
2	MILK PREPARATION	Normal Condition	Use of electricity	Depletion of natural resources	Electricity Supply Act 1990	5 1 1 1 1 9	Significant Risk	1. Electric meter usage	-	Admin	-	-

Figure 12: Interface of pdf form

6. Conclusion

In conclusion, the system was developed to help improve the business process of operating unit in rating and recording the environment aspect impact. Besides that, by having this system, they can carry out a comprehensive report using web-based approach, and the report can compliance with certification and law requirement. Improvement features on the system such as accessibility of system can be available at any device and places, zero-redundancy of data also consider in the continuation of research.

Acknowledgment

First, I would like to express my deepest appreciation to MZR Global Sdn Bhd and Sawit Kinabalu Sdn Bhd for providing technical support and suggestions through each stage of the project. Then, I would like to thank my supervisor, Prof. Madya Dr. Shahreen Binti Kasim for her guidance and support throughout the whole duration of the project. Besides that, I am also grateful to my beloved parents for their patience and encouragement from the beginning of the project until the end. Finally, I would like to thank my friends and classmates who helped me with the project directly and indirectly.

References

[1] Stephanie, V. (2022). *Green Building Standards and Certification Systems | WBDG - Whole Building Design Guide*. Wbdg.org. https://www.wbdg.org/resources/green-building-standards-and-certification-systems

[2] Bagwan, M. K., & Ghule, P. S. *(2019). A Modern Review on Laravel-PHP Framework. IRE Journals, 2(12), 1-3.*

[3] Schwalbe, K. (2021). *Information technology project management 8th edition kathy schwalbe solutions manual*. Studocu; Studocu. https://www.studocu.com/row/document/aljamaa%D8%A9-altknolojy%D8%A9-iraq/catedra-ingenieria-civil-i/information-technology-project-management-8th-edition-kathy-schwalbe-solutions-manual/15763806

[4] Stickland, B. (2017, February 17). *What are Software Development Methodologies? | Alliance Software*. Alliance Software. https://www.alliancesoftware.com.au/introduction-software-development-methodologies/

[5] Odhiambo, Didacus. (2018, September 24). System Design in Software Development. Retrieved from https://medium.com/the-andela-way/systemdesign-in-software-development-f360ce6fcbb9

[6] Gosala, B., Chowdhuri, S. R., Singh, J., Gupta, M., & Mishra, A. (2021). Automatic Classification of UML Class Diagrams Using Deep Learning Technique: Convolutional Neural Network. *Applied Sciences*, *11*(9), 4267. https://doi.org/10.3390/app11094267

[7] Hutajulu, T. A., Priyadi, Y., & Gandhi, A. (2022). Text Data Processing in Requirement Specifications as a Reference for Similarities Between Use Case Diagrams and Use Case Descriptions for Smart Sleeping Lamp Application Documents. *2022 IEEE World AI IoT Congress (AIIoT)*. https://doi.org/10.1109/aiiot54504.2022.9817197